THE TADPOLES OF TWO QUEENSLAND FROGS (ANURA: HYLIDAE, MYOBATRACHIDAE)

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The tadpoles of two Queensland frogs, *Cyclorana brevipes* and *Uperoleia mimula*, are described and illustrated. *C. brevipes* is similar to previously described *Cyclorana*, having a rotund body and a 2(2)/3(1) tooth row formula. *U. mimula* shares with *U. lithomoda* an extremely small oral disc, a tooth row formula of 2(2)/3, and a black tail tip. □ *tadpoles, Hylidae, Myobatrachidae, Cyclorana brevipes, Uperoleia mimula, Queensland*

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Despite increased interest in Queensland's anuran fauna, the larvae of many species remain unknown. Given current concern about the conservation status of many species (Tyler, 1991; Wyman, 1990), accurate identification of larvae is important. The ability to identify larvae simplifies determination of the distribution and abundance of species, and is necessary for elucidation of their ecologies and life histories.

During research on frog communities in savanna woodland near Townsville, we collected amplexing pairs of two frogs whose larvae were unknown: the hylid *Cyclorana brevipes* and the myobatrachid *Uperoleia mimula*. These frogs were returned to the laboratory where oviposition occurred and larvae were reared to metamorphosis. In this paper we describe and illustrate the tadpoles of these species.

METHODS

Amplectant frogs transported to the laboratory were placed in large glass aquaria with 2-3cm of water at 25°C. Oviposition occurred within 12 hrs. When *C. brevipes* embryos reached stage 23 (Gosner, 1960) they were placed in 1000 litre plastic cattle tanks on the James Cook University campus. These tanks were assembled as described by Hearnden (1992), and supported a complex aquatic community similar to those found in temporary pools in the Townsville area, but lacking other anurans and most predators. Water temperature in the tanks ranged from 20-34°C. *U. mimula* tadpoles were reared for several weeks under artificial conditions in the laboratory prior to placement in the tanks, so no attempt was made to estimate larval period for this species.

Preserved specimens were measured using a dissecting microscope with an eyepiece micrometer. Terminology follows Altig (1970) and McDiarmid & Altig (1989). All measurements are in millimetres. Measurements involving apertures were taken from the centre of the aperture. The staging system is that of Gosner (1960). Specimens are lodged in the tadpole collection of the Zoology Department, James Cook University.

Cyclorana brevipes
(Figs 1,2)

An amplexing pair was collected in a ditch at the intersection of Black River Road and Bruce Highway, 20km north of Townsville, Qld, on the evening of 2/3/90. Oviposition occurred before 0800 on 3/3/90 (n = 930 eggs), and embryos reached stage 23 by 5/3/90. The first metamorph (stage 46), observed on 28/3/90, measured 23.0mm snout to vent length and weighed 1.26g. The minimum total duration of development (fertilization to metamorphosis) was 25 days.

A stage 37 tadpole has the following measurements (millimetres): 56.0 total length, 22.5 body length, 4.5 basal tail muscle height, 3.5 basal tail muscle width, 2.8 maximum dorsal fin height located 10.8 from body terminus, 2.5 maximum ventral fin height located 11.0 from body terminus, 11.8 maximum body width, 10.8 maximum body height, 2.5 eye diameter, 0.9 pupil diameter, 7.2 interorbital distance, 0.5 × 0.3 narial diameters, 2.9 internarial distance, 3.2 snout-naris, 6.4 snout-eye, 11.8 snout-spiracle, 3.3 naris-eye, and 5.4 transverse oral disc diameter.

The oral disc is anteroventral and non-emarginate. The marginal papillae are in a single row

ventrally, with a wide gap dorsally and additional submarginal papillae laterally and dorsolaterally. The labial tooth row formula is 2(2)/3(1). The jaw sheaths are keratinized, the lower jaw sheath broad and V-shaped, and the upper jaw sheath narrow and curved (Fig. 1). The serrations on the margin of the upper jaw sheath are much finer than those on the lower jaw sheath.

The body is rotund, the snout is rounded in dorsal view, and the eyes are dorsolateral. The nares are dorsal and oriented anterolaterally. The sinistral spiracle is short and unpigmented, is almost ventral, and is not visible in dorsal view. The vent tube is short and dextral. The dorsal fin is not arched, and tapers to a narrow point posteriorly. It originates slightly anterior to the junction of the body and the tail musculature (Fig. 2). Dark pigmentation deep in the skin layers covers the intestinal coil dorsolaterally, from a line just posterior to the eyes. Lighter, diffuse brown pigment occurs on the rest of the body, tail muscle and fins. A patch of darker pigmentation almost surrounds the nares, with a lateral gap.

Uperoleia mimula
(Figs 3,4)

An amplexing pair was captured at an overflow area of a small creek near Bentley Dam, approximately 20km south of Townsville, in March 1990. A stage 38 specimen has the following measurements: 20.2 total length, 10.0 body length, 2.3 basal tail muscle height, 1.7 basal tail muscle width, 1.9 maximum dorsal fin height located 3.8 from body terminus, 1.3 maximum ventral fin height located 4.8 from body terminus, 6.6 maximum body width, 5.4 maximum body height, 1.4 eye diameter, 0.4 pupil diameter, 2.9 interorbital distance, 0.4 narial diameter, 1.3 internarial distance, 1.1 snout-naris, 2.4 snout-eye, 8.0 snout-spiracle, 1.4 naris-eye, 1.6 transverse oral disc diameter.

The oral disc is extremely small, located anteroventrally, and is non-emarginate. The jaw sheaths are narrow and keratinized. The labial tooth row formula is 2(2)/3. The short P3 tooth row is supported on an unusual flexible flap. Large marginal papillae in a single row surround the disc, with a large anterior gap and a narrow posterior gap (Fig. 3). The snout is rounded in dorsal view and the eyes are dorsal. The nares are located dorsally and open almost verically.

The body is slightly flattened dorsoventrally, and is oval when viewed from above. The spiracle is sinistral, located laterally and near the posterior of the body. It is extremely short, lightly pigmented, and oriented posteriorly (Fig. 4). The anus is dextral. Diffuse brown pigment occurs on the dorsal and lateral surfaces of the body, and on the tail muscle. Pigmentation on the fins is concentrated at the posterior tip in tadpoles that have not reached stage 31, forming a conspicuous black 'flag' that occupies approximately the most posterior 15-20% of the tail. From about stage 31 the pigment gradually disperses, until at stage 36 the 'flag' is hardly visible.

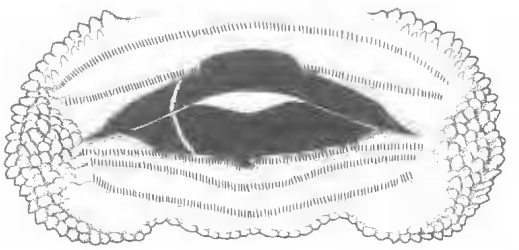

FIG. 1. Oral disc of *Cyclorana brevipes*. Scale bar = 1mm.

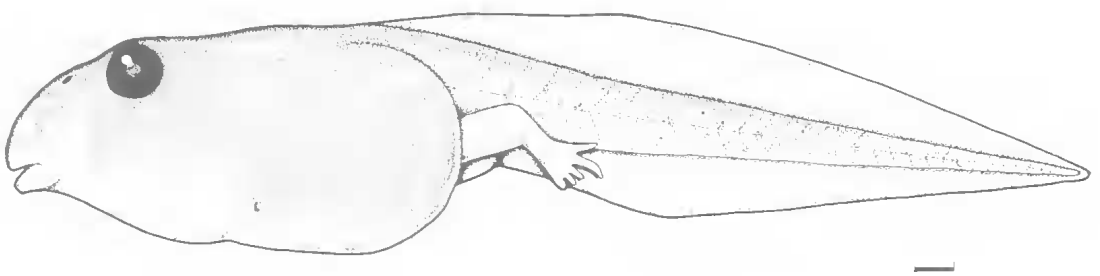

FIG. 2. Lateral view of a stage 37 *Cyclorana brevipes*. Scale bar = 2mm.

DISCUSSION

The tadpole of *Cyclorana brevipes* is difficult to distinguish from other *Cyclorana* previously described (Tyler & Martin, 1975; Tyler et al., 1982; Tyler et al., 1983; Watson & Martin, 1973). All have rotund bodies, tooth row formulae of 2(2)/3(1), and similar configurations of oral papillae. Tyler et al. (1983) were unable to distinguish tadpoles of *C. australis* from *C. longipes* when they occured together in ponds in the Northern Territory, until the distinctive dorsal pattern of *C. longipes* appeared near metamorphosis. The tadpoles of these species reached different maximum sizes, but this character is only useful if late stage tadpoles are available for comparison.

Because of the extreme morphological conservativism displayed by this genus, accurate identification of Queensland tadpoles can best be achieved by the construction of regional keys that compare only the species found in a given area. The similarities in oral morphology exhibited by *Cyclorana* tadpoles will make knowledge about colour in life (and in preservative), and about size differences during development, fundamental for accurate identification. Knowledge about Queensland *Cyclorana* is insufficient for such keys to be constructed at this stage.

Over 20 species of *Uperoleia* are now known to occur in Australia (Davies et al., 1986). However, information on the larval morphology of *Uperoleia* species is available for only four species, so meanigful comparisons are difficult. Two species, *U. inundata* (Tyler et al., 1983) and *U. lithomoda* (Davies et al., 1986) share with *U. mimula* a tooth row formula of 2(2)/3. *U. lithomoda* also shares with *U. mimula* a black tail tip. *U. laevigata* (as *U. marmorata*) is reported to lack gaps in any of the toothrows and has a formula of 1/3 (Moore, 1961). *U. tyleri* (as *U. marmorata*) differs from *mimula* in having a gap in the P1 tooth row (Watson & Martin, 1973).

None of these authors mention the unusual flap supporting the P3 tooth row. However the illustration of *U. inundata* in Tyler et al. (1983) suggests that this structure may be present in that species, and careful examination of other species may reveal its presence. The morphology and function of this structure require further study, as does the possibilty that it may be a generically diagnostic feature.

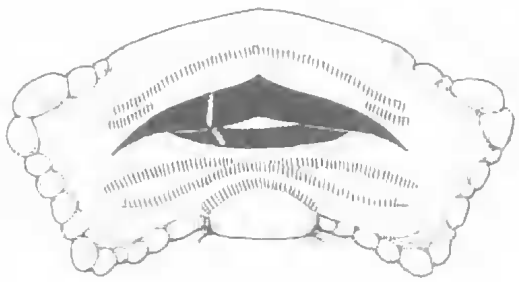

FIG. 3. Oral disc of *Uperoleia mimula*. Scale bar = 2mm.

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REFERENCES

ALTIG, R.A. 1970. A key to the tadpoles of the continental United States and Canada. Herpetologica 26: 180-207.

DAVIES, M., MCDONALD, K.R. & CORBEN, C. 1986. The genus *Uperoleia* Gray (Anura: Leptodactylidae) in Queensland, Australia. Proceedings of the Royal Society of Victoria 98: 147-88.

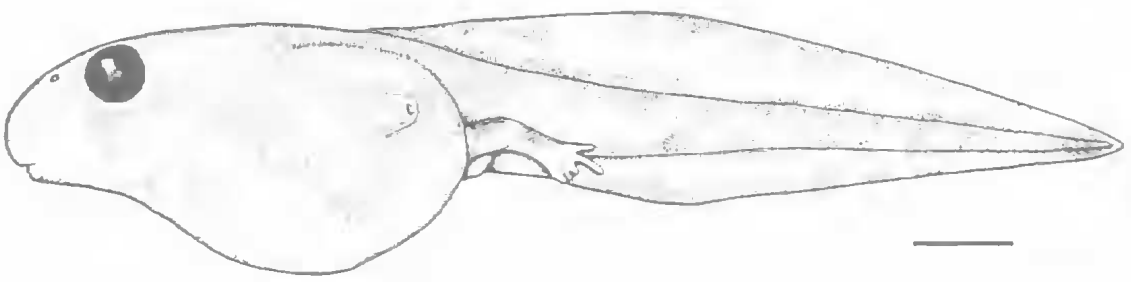

FIG. 4. Lateral view of a stage 38 *Uperoleia mimula*. Scale bar = 2mm.

GOSNER, K.L. 1960. A simplified table for staging anuran embryos and larvae with notes on identification. Herpetologica 16: 183-190.

HEARNDEN, M. N. 1992. The reproductive and larval ecology of *Bufo marinus* (Anura: Bufonidae). (Unpublished Ph.D. thesis, James Cook University, Townsville).

MCDIARMID, R.W. & ALTIG, R.A. 1989. Description of a bufonid and two hylid tadpoles from western Ecuador. Alytes 8: 51-60.

MOORE, J.A. 1961. The frogs of eastern New South Wales. Bulletin of the American Museum of Natural History 121: 149-386.

TYLER, M.J. 1991. Declining amphibian populations — a global phenomenon? An Australian perspective. Alytes 9: 33-60.

TYLER, M.J., CROOK, G.A. & DAVIES, M. 1983. Reproductive biology of the frogs of the Magela Creek system, Northern Territory. Records of the South Australian Museum 18: 415-440.

TYLER, M.J., DAVIES, M. & MARTIN, A.A. 1982. Biology, morphology and distribution of the Australian fossorial frog *Cyclorana cryptotis* (Anura: Hylidae). Copeia (2): 260-264.

TYLER, M.J. & MARTIN, A.A. 1975. Australian leptodactylid frogs of the *Cyclorana australis* complex. Transactions of the Royal Society of South Australia 99: 93-99.

WATSON, G.F. & MARTIN, A.A. 1973. Life history, larval morphology and relationships of Australian leptodactylid frogs. Transactions of the Royal Society of South Australia 97: 33-45.

WYMAN, R.L. 1990. What's happening to the amphibians? Conservation Biology 4: 350-352.